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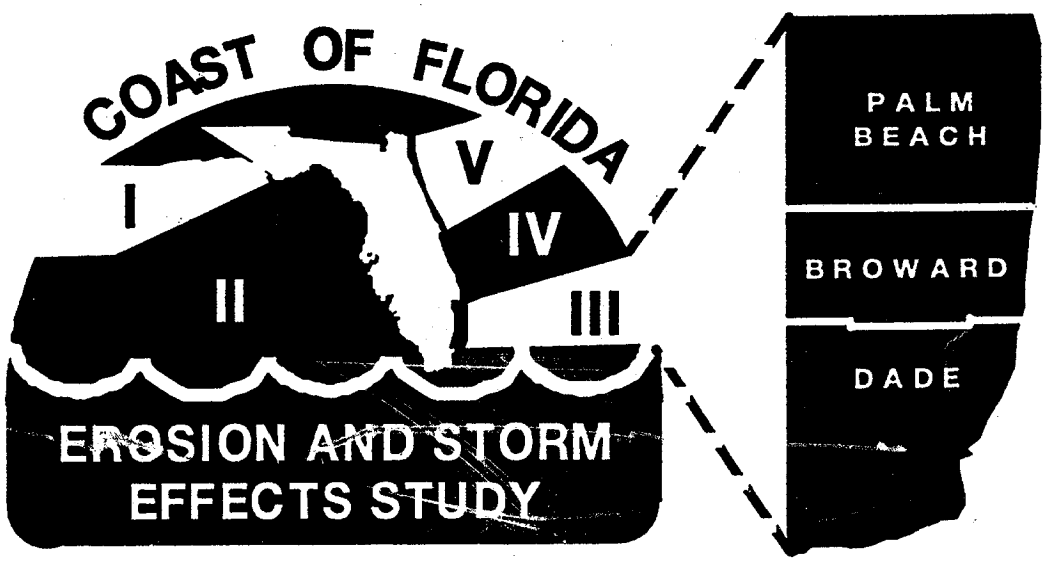
FEASIBILITY REPORT

COAST OF FLORIDA EROSION AND STORM EFFECTS STUDY REGION III

with FINAL ENVIRONMENTAL IMPACT STATEMENT



U. S. ARMY CORPS
OF ENGINEERS
Jacksonville District

FLORIDA

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COAST OF FLORIDA
EROSION AND STORM EFFECTS STUDY
REGION III
WITH FINAL ENVIRONMENTAL IMPACT STATEMENT

SYLLABUS

1. This report summarizes a cooperative cost shared feasibility study on the beach erosion and storm damage problems of the Atlantic Ocean shoreline of the lower southeast coast of Florida, including Palm Beach, Broward and Dade Counties. Included in this report are the results of planning, engineering, environmental, economic and real estate studies of the area and its shoreline erosion problems over 88 miles of shoreline; and recommendations for modifications of the existing beach erosion control and shore protection projects.

2. The coastal processes and natural resources along Florida's Gulf and Atlantic shoreline are being investigated on a regional basis, instead of a conventional project by project basis. It is expected that by developing/creating regional projects, considerable savings can be realized in the construction and maintenance of existing Federal projects, both for storm damage reduction and navigation. Considerable advances in computer technology within the last decade have resulted in the development of new coastal numerical modeling applications and geographic information systems (GIS). This new technology was utilized in this study. The comprehensive body of knowledge, information and data used has been collected and stored in the GIS database.

3. To effectively manage and support such a comprehensive and extensive study, Florida was divided into five coastal regions based on distinct differences between the areas, such as wave climate, coastal processes, and beach characteristics. The regions are as follows: Region I - panhandle; Region II - peninsular gulf coast to the northern extent of the Keys; Region III - southern east coast; Region IV - central east coast; and Region V - northern east coast (Figure 1). Separate feasibility studies will be conducted, and reports prepared for each region.

4. The first region studied and the focus of this Feasibility Report is Region III. This region includes Dade County from the southern end of Key Biscayne northward through Broward County up to and including Jupiter Inlet in northern Palm Beach County. This region was identified as the first region for study since it is the most densely populated coastal region in Florida.

5. The selected plan consists of three projects, Palm Beach County, Broward County, and Dade County containing 21 project segment elements over 88 miles of shoreline. The projects are as follows:

Palm Beach County Project

1) Jupiter/Carlin segment
2) Juno/Ocean Cay segment
3) Lake Worth Inlet Sand Transfer Plant (STP)
4) North-end Palm Beach Island segment
5) Palm Beach Island segment
6) South-end Palm Beach Island segment
7) South Lake Worth Inlet STP
8) Ocean Ridge segment
9) Delray Beach segment
10) Highland Beach segment
11) Boca Raton segment

Broward County Project
12) Deerfield/Hillsboro Beach segment
13) Pompano/Lauderdale-by-the-sea segment
14) Fort Lauderdale segment
15) J.U. Lloyd segment
16) Dania segment
17) Hollywood/Hallandale segment

Dade County Project
18) Golden Beach segment
19) Sunny Isles segment
20) Bal Harbour/Surfside/Miami Beach segment
21) Key Biscayne segment

6. Project summaries listing new projects, existing projects and project mods follow this syllabus. The total first cost to implement these projects is $87,545,000.

7. There are three recommended projects, Dania, Lake Worth Inlet Sand Transfer Plant and South Lake Worth Inlet Sand Transfer Plant with a total first cost of $10,111,000. The Dania and South Lake Worth Inlet STP would provide significant cost savings to future nourishments of existing projects. The Lake Worth Inlet Sand Transfer Plant is recommended as a modification to the Federal navigation project at Palm Beach Harbor. The recommended projects contained herein reflect the information available at this time and current Departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national Civil Works construction program nor the perspective of higher review levels within the Executive Branch.

8. The Department of the Army Fiscal Year 1996 Civil Works allocations reflect the President's commitment to focus the development of the Nation's water resources on projects and programs which have national significance. The allocations maintain the Federal government's commitments to non-Federal sponsors for phases of work already underway but do not include any requests for new studies, design or construction for shore protection projects. The U.S. Army Corps of Engineers may or may not be allowed to fund plans and specifications and construction for Region III shore protection projects. The Civil Works budgetary objectives for the shore protection program of the Administration are under review, and may change as the Congress reviews the President's Fiscal Year 1998 budget requests and prepares appropriation legislation.

9. Consequently, the recommendations, especially those relating to Federal participation may be modified before they are transmitted to the Congress as proposals for authorization and implementation funding. Prior to transmittal to the Congress, the sponsor, interested Federal agencies, and other parties will be advised of any modifications and will be afforded an opportunity to comment further.

RECOMMENDED PROJECT SUMMARIES

Project:	Palm Beach County, FL Shore Protection Project
Segment:	Lake Worth Inlet Sand Transfer Plant
Project Purpose:	Shore Damage Mitigation
Existing/New Project:	New Project
Project Mod/No Mod:	No Modification
Project Length:	0.76 miles
Monument Range:	R-75 to R-78
Segment Design	
No. of Jet Pumps:	5 Six Inch Pumps
Type Transfer Facility:	Shore-Normal Concrete and Timber Pier
Number of Booster Pumps:	1
Pipe Diameter:	12 Inch
Sand Bypassing Capacity:	160,000 Cubic Yards per Year
Number of Outfalls:	3
Environmental Impact	
Hardground Impacted:	No Hardgrounds Impacted
Benefits	
Interest Rate:	7.625 Percent
Total Annual Benefits:	$494,100
Costs	
Effective Date of Pricing:	5/16/95
First Cost:	$3,914,300
Interest During Construction (IDC):	$75,300
Total Investment Cost:	$3,989,700
Yearly O&M:	$73,600
Total Average Annual Cost:	$385,700
B/C Ratio:	1.3
Net Annual Benefits:	$108,400
Recommended Federal Participation:	Limited to Initial Construction
Cost Sharing	
Federal:	100.00%
Non-Federal:	0.00%
Federal Cost, Initial Construction:	$3,989,700
Non-Federal Cost, Initial Construction:	$0
Federal Cost, O&M:	$0
Non-Federal Cost, O&M:	$73,600

RECOMMENDED PROJECT SUMMARIES

Project:	Palm Beach County, Florida Shore Protection Project
Segment:	South Lake Worth Inlet Sand Transfer Plant
Existing/New Project:	New Project
Project Mod/No Mod:	No Mod
Project Length:	1.13 miles
Monument Range:	R-152-158
Target Bypassing Rate:	120,000 cy
No. of Outfalls:	1

Environmental Impact

Hardground Impacted:	0

Costs

Effective Date of Pricing:	5/16/95
First Cost:	$3,914,345
Interest During Construction (IDC):	$75,326
Investment Cost:	$3,989,671
Yearly O&M:	$55,200
Average Annual Cost:	$385,732

Recommended Federal Participation: 50 years

Cost Sharing

Federal:	12%
Non-Federal:	88%
Total Federal Cost:	$ 469,721
Total Non-Federal Cost:	$3,444,624

RECOMMENDED PROJECT SUMMARIES

Project:	Broward County, Florida Shore Protection Project
Segment:	Dania
Existing/New Project:	New Project
Project Mod/No Mod:	No mod
Project Length:	0.6 miles
Monument Range:	R-98-101
Potential Nearshore Berms:	No
Segment Design	
Berm Width Extension:	125 feet
Berm Height:	10 feet NGVD
Equilibrium Toe of Fill (With Advanced Nourishment):	220 feet
Foreshore Slope	1 V to 15 H
Nearshore Slope	1 V to 40 H
Initial Fill Volume (Including Advanced Nour.):	460,840 cubic yards
Renourishment Interval:	6 years
Renourishment Volume:	252,500 cubic yards
Environmental Impact	
Hardground Impacted:	0
New Beach Created:	9.1 acres
Benefits	
Interest Rate:	7.625%
Total Annual Benefits:	$ 4,385,000
Costs	
Effective Date of Pricing:	5/16/95
Initial Fill and Advanced Nour.:	$2,282,700
Interest During Construction (IDC):	$43,900
Each Renourishment Cost:	$180,850
Renourishments During Proj. Life:	8
Average Annual Cost:	$362,900
B/C Ratio:	12.1
Net Annual Benefits:	$ 4,022,100
Recommended Federal Participation:	50 years
Cost Sharing	
Federal:	65%
Non-Federal:	35%
Total Federal Cost:	$ 1,483,755
Total Non-Federal Cost:	$798,945

NED PROJECT SUMMARIES

Project: Palm Beach County, Florida Shore Protection Project
Segment: Jupiter/Carlin
Existing/New Project: Existing
Project Mod/No Mod: No Mod
Project Length: 1.1 miles
Monument Range: R-13-19
Potential Nearshore Berms: No

Segment Design
Berm Width Extension: 0 feet
Berm Height:
Equilibrium Toe of Fill (With Advanced Nourisment):
Foreshore Slope:
Nearshore Slope:
Initial Fill Volume (With Advanced Nourishment):
Renourishment Interval: 7 years
Renourishment Volume:

Environmental Impact
Hardground Impacted: 0
New Beach Created: 0

Benefits
Interest Rate: 7.625 %
Total Annual Benefits:

Costs
Effective Date of Pricing:
Initial Fill and Advanced Nour.:
Interest During Construction (IDC):
Each Renourishment Cost:
Renourishments During Proj. Life:
Average Annual Cost:

B/C Ratio:
Net Annual Benefits:
Recommended Federal Participation: 50 years

Cost Sharing
Federal:
Non-Federal:
Total Federal Cost:
Total Non-Federal Cost:

NED PROJECT SUMMARIES

Project:	Palm Beach County, Florida Shore Protection Project
Segment:	Juno/Ocean Cay
Existing/New Project:	New Project
Project Mod/No Mod:	No Mod
Project Length:	2.75 miles
Monument Range:	R-27-41
Potential Nearshore Berms:	Yes

Segment Design

Berm Width Extension:	55 feet
Berm Height:	9 feet NGVD
Equilibrium Toe of Fill (With Advanced Nourishment):	300 feet
Foreshore Slope:	1 V to 10 H
Nearshore Slope:	1 V to 30 H
Initial Fill Volume (Including Advanced Nour.):	737,800 cubic yards
Renourishment Interval:	7 years
Renourishment Volume:	240,000 cubic yards

Environmental Impact

Hardground Impacted:	1.7 acres
New Beach Created:	18.3 acres

Benefits

Interest Rate:	7.625 %
Total Annual Benefits:	$ 5,198,700

Costs

Effective Date of Pricing:	5/16/95
Initial Fill and Advanced Nour.:	$4,236,200
Interest During Construction (IDC):	$81,500
Each Renourishment Cost:	$2,596,800
Renourishments During Proj. Life:	7
Average Annual Cost:	$631,600
B/C Ratio:	8.2
Net Annual Benefits:	$ 5,198,700
Recommended Federal Participation:	50 years

Cost Sharing

Federal:	44.1%
Non-Federal:	55.9%
Total Federal Cost:	$ 1,904,106
Total Non-Federal Cost:	$ 2,413,594

NED PROJECT SUMMARIES

Project:	Palm Beach County, Florida Shore Protection Project
Segment:	North-end Palm Beach Island
Existing/New Project:	New Project
Project Mod/No Mod:	No Mod
Project Length:	1.95 miles
Monument Range:	R-76-R-85
Potential Nearshore Berms:	No

Segment Design

Berm Width Extension:	10 feet
Berm Height:	9 feet NGVD
Equilibrium Toe of Fill (With Advanced Nourishment):	281 feet
Foreshore Slope:	1 V to 10 H
Nearshore Slope:	1 V to 30 H
Initial Fill Volume (Including Advanced Nour.):	339,400 cubic yards
Renourishment Interval:	4 years
Renourishment Volume:	239,400 cubic yards

Environmental Impact

Hardground Impacted:	18.0 acres
New Beach Created:	2.3 acres

Benefits

Interest Rate:	7.625 %
Total Annual Benefits:	$ 1,240,200

Costs

Effective Date of Pricing:	5/16/95
Initial Fill and Advanced Nour.:	$9,387,600
Interest During Construction (IDC):	$153,500
Each Renourishment Cost:	$2,587,500
Renourishments During Proj. Life:	12
Average Annual Cost:	$897,600
B/C Ratio:	1.4
Net Annual Benefits:	$ 342,600
Recommended Federal Participation:	50 years

Cost Sharing

Federal:	59.40%
Non-Federal:	40.60%
Total Federal Cost:	$ 5,576,234
Total Non-Federal Cost:	$3,811,366

NED PROJECT SUMMARIES

Project:	Palm Beach County, Florida Shore Protection Project
Segment:	Palm Beach Island
Existing/New Project:	New Project
Project Mod/No Mod:	No Mod
Project Length:	3.1 miles
Monument Range:	R-91-R-105
Potential Nearshore Berms:	Yes

Segment Design

Berm Width Extension:	25 feet
Berm Height:	9 feet NGVD
Equilibrium Toe of Fill (With Advanced Nourishment):	455 feet
Foreshore Slope:	1 V to 10 H
Nearshore Slope:	1 V to 30 H
Initial Fill Volume (Including Advanced Nour.):	1,025,700 cubic yards
Renourishment Interval:	4 years
Renourishment Volume:	372,400 cubic yards

Environmental Impact

Hardground Impacted:	3.65 acres
New Beach Created:	9.3 acres

Benefits

Interest Rate:	7.625 %
Total Annual Benefits:	$ 6,595,800

Costs

Effective Date of Pricing:	5/16/95
Initial Fill and Advanced Nour.:	$6,572,600
Interest During Construction (IDC):	$126,500
Each Renourishment Cost:	$372,400
Renourishments During Proj. Life:	12
Average Annual Cost:	$1,214,000
B/C Ratio:	5.4
Net Annual Benefits:	$ 5,381,700
Recommended Federal Participation:	50 years

Cost Sharing

Federal:	32.20%
Non-Federal:	67.80%
Total Federal Cost:	$ 2,116,377
Total Non-Federal Cost:	$4,456,223

NED PROJECT SUMMARIES

Project:	Palm Beach County, Florida Shore Protection Project
Segment:	South-end Palm Beach Island
Existing/New Project:	New Project
Project Mod/No Mod:	No Mod
Project Length:	3.25 miles
Monument Range:	R-116-132
Potential Nearshore Berms:	No

Segment Design

Berm Width Extension:	35
Berm Height:	9 feet NGVD
Equilibrium Toe of Fill (With Advanced Nourishment):	432 feet
Foreshore Slope	1 V to 10 H
Nearshore Slope	1 V to 30 H
Initial Fill Volume (Including Advanced Nour.):	674,500 cubic yards
Renourishment Interval:	4 years
Renourishment Volume:	425,600 cubic yards

Environmental Impact

Hardground Impacted:	5.4 acres
New Beach Created:	13.8 acres

Benefits

Interest Rate:	7.625%
Upland Development:	
Total Annual Benefits:	$ 3,364,700

Costs

Effective Date of Pricing:	5/16/95
Initial Fill and Advanced Nour.:	$5,989,100
Interest During Construction (IDC):	$115,300
Each Renourishment Cost:	$4,018,800
Renourishments During Proj. Life:	12
Average Annual Cost:	$1,370,700
B/C Ratio:	2.5
Net Annual Benefits:	1994000
Recommended Federal Participation:	50 years

Cost Sharing

Federal:	50.70%
Non-Federal:	49.30%
Total Federal Cost:	$ 3,036,474
Total Non-Federal Cost:	$2,952,626

NED PROJECT SUMMARIES

Project:	Palm Beach County, Florida Shore Protection Project
Segment:	Ocean Ridge
Existing/New Project:	Existing
Project Mod/No Mod:	No Mod
Project Length:	1.35 miles
Monument Range:	R-152-159
Potential Nearshore Berms:	Yes

Segment Design

Berm Width Extension:	0 feet
Berm Height:	
Equilibrium Toe of Fill (With Advanced Nourishment):	
Foreshore Slope	
Nearshore Slope	
Initial Fill Volume (Including Advanced Nour.):	
Renourishment Interval:	8 years
Renourishment Volume:	

Environmental Impact

Hardground Impacted:	0
New Beach Created:	0

Benefits

Interest Rate:	7.625 %
Total Annual Benefits:	

Costs

Effective Date of Pricing:	
Initial Fill and Advanced Nour.:	
Interest During Construction (IDC):	
Each Renourishment Cost:	
Total Project Cost:	
Average Annual Cost:	
B/C Ratio:	
Net Annual Benefits:	
Recommended Federal Participation:	50 years

Cost Sharing

Federal:	
Non-Federal:	
Total Federal Cost:	
Total Non-Federal Cost:	

NED PROJECT SUMMARIES

Project:	Palm Beach County, Florida Shore Protection Project
Segment:	Delray Beach
Existing/New Project:	Existing
Project Mod/No Mod:	Project Mod
Project Length:	2.7 miles
Monument Range:	R-175-188
Potential Nearshore Berms:	Yes
Segment Design	
Berm Width Extension:	+20 feet
Berm Height:	9 feet NGVD
Equilibrium Toe of Fill (With Advanced Nourishment):	+290 feet
Foreshore Slope	1 V to 10 H
Nearshore Slope	1 V to 30 H
Initial Fill Volume (Including Advanced Nour.):	+155,300 cubic yards
Renourishment Interval:	7 years
Renourishment Volume:	+155,300 cubic yards
Environmental Impact	
Hardground Impacted:	0
New Beach Created:	6.5 acres
Benefits	
Interest Rate:	7.625 %
Loss of Land:	
Total Annual Benefits:	$ 3,176,000
Costs	
Effective Date of Pricing:	5/16/95
Initial Fill and Advanced Nour.:	$565,300
Interest During Construction (IDC):	$10,900
Each Renourishment Cost:	$478,900
Renourishments During Proj. Life:	7
Average Annual Cost:	$109,000
B/C Ratio:	29.1
Net Annual Benefits:	$ 3,067,000
Recommended Federal Participation:	50 years
Cost Sharing	
Federal:	57.90%
Non-Federal:	42.10%
Total Federal Cost:	$ 327,309
Total Non-Federal Cost:	$237,991

NED PROJECT SUMMARIES

Project:	Palm Beach County, Florida Shore Protection Project
Segment:	Highland Beach
Existing/New Project:	New Project
Project Mod/No Mod:	No mod
Project Length:	3 miles
Monument Range:	R-188-203.5
Potential Nearshore Berms:	Yes

Segment Design

Berm Width Extension:	120 feet
Berm Height:	9 feet NGVD
Equilibrium Toe of Fill (With Advanced Nourishment):	450 feet
Foreshore Slope	1 V to 10 H
Nearshore Slope	1 V to 30 H
Initial Fill Volume (Including Advanced Nour.):	1,765,300 cubic yards
Renourishment Interval:	7 years
Renourishment Volume:	820,280 cubic yards

Environmental Impact

Hardground Impacted:	1.9 acres
New Beach Created:	49.5 acres

Benefits

Interest Rate:	7.625 %
Total Annual Benefits:	$ 4,313,700

Costs

Effective Date of Pricing:	5/16/95
Initial Fill and Advanced Nour.:	$7,812,300
Interest During Construction (IDC):	$150,300
Each Renourishment Cost:	$4,721,900
Renourishments During Proj. Life:	7
Average Annual Cost:	$1,157,200
B/C Ratio:	3.7
Net Annual Benefits:	$ 3,156,500
Recommended Federal Participation:	50 years

Cost Sharing

Federal:	60.60%
Non-Federal:	39.40%
Total Federal Cost:	$ 4,734,254
Total Non-Federal Cost:	$3,078,046

NED PROJECT SUMMARIES

Project:	Palm Beach County, Florida Shore Protection Project
Segment:	Boca Raton
Existing/New Project:	Existing
Project Mod/No Mod:	No Mod
Project Length:	1.65 miles
Monument Range:	R-205-213
Potential Nearshore Berms:	Yes

Segment Design

Berm Width Extension:	0 feet
Berm Height:	
Equilibrium Toe of Fill (With Advanced Nourishment):	
Foreshore Slope	
Nearshore Slope	
Initial Fill Volume (Including Advanced Nour.):	
Renourishment Interval:	8
Renourishment Volume:	

Environmental Impact

Hardground Impacted:	0
New Beach Created:	0

Benefits

Interest Rate:	7.625 %
Total Annual Benefits:	

Costs

Effective Date of Pricing:	
Initial Fill and Advanced Nour.:	
Interest During Construction (IDC):	
Each Renourishment Cost:	
Renourishments During Proj. Life:	
Total Project Cost:	
Average Annual Cost:	

B/C Ratio:	
Net Annual Benefits:	
Recommended Federal Participation:	50 years

Cost Sharing

Federal:	
Non-Federal:	
Total Federal Cost:	
Total Non-Federal Cost:	

NED PROJECT SUMMARIES

Project:	Broward County, Florida Shore Protection Project
Segment:	Deerfield Beach/Hillsboro Beach
Existing/New Project:	New Project
Project Mod/No Mod:	No mod
Project Length:	4.4 miles
Monument Range:	R-1-24
Potential Nearshore Berms:	Yes
Segment Design	
Berm Width Extension:	30 feet
Berm Height:	9 feet NGVD
Equilibrium Toe of Fill (With Advanced Nourishment):	406 feet
Foreshore Slope	1 V to 10 H
Nearshore Slope	1 V to 30 H
Initial Fill Volume (Including Advanced Nour.):	1,055,820 cubic yards
Renourishment Interval:	7 years
Renourishment Volume:	309,120 cubic yards
Environmental Impact	
Hardground Impacted:	4.65 acres
New Beach Created:	16.0 acres
Benefits	
Interest Rate:	7.625 %
Total Annual Benefits:	$ 8,219,100
Costs	
Effective Date of Pricing:	5/16/95
Initial Fill and Advanced Nour.:	$7,136,800
Interest During Construction (IDC):	$137,300
Each Renourishment Cost:	$2,894,600
Renourishments During Proj. Life:	7
Average Annual Cost:	$896,600
B/C Ratio:	9.2
Net Annual Benefits:	$ 7,332,500
Recommended Federal Participation:	50 years
Cost Sharing	
Federal:	40.00%
Non-Federal:	60.00%
Total Federal Cost:	$ 2,854,720
Total Non-Federal Cost:	$4,282,080

NED PROJECT SUMMARIES

Project:	Broward County, Florida Shore Protection Project
Segment:	Pompan/Lauderdale-by-the-Sea
Existing/New Project:	Existing
Project Mod/No Mod:	Project Mod
Project Length:	5.2 miles
Monument Range:	R-24-53
Potential Nearshore Berms:	Yes

Segment Design

Berm Width Extension:	+35 feet
Berm Height:	9 feet NGVD
Equilibrium Toe of Fill (With Advanced Nourishment):	+365 feet
Foreshore Slope	1 V to 20 H
Nearshore Slope	1 V to 30 H
Initial Fill Volume (Including Advanced Nour.):	+600,000 cubic yards
Renourishment Interval:	12 years
Renourishment Volume:	+600,000 cubic yards

Environmental Impact

Hardground Impacted:	12.25 acres
New Beach Created:	22.0 acres

Benefits

Interest Rate:	7.625 %
Total Annual Benefits:	$ 1,319,600

Costs

Effective Date of Pricing:	5/16/95
Initial Fill and Advanced Nour.:	$8,628,300
Interest During Construction (IDC):	$199,200
Each Renourishment Cost:	$2,236,900
Renourishments During Proj. Life:	4
Average Annual Cost:	$810,600
B/C Ratio:	1.6
Net Annual Benefits:	$ 509,000
Recommended Federal Participation:	50 years

Cost Sharing

Federal:	64.30%
Non-Federal:	35.70%
Total Federal Cost:	$ 5,547,997
Total Non-Federal Cost:	$3,080,303

NED PROJECT SUMMARIES

Project:	Broward County, Florida Shore Protection Project
Segment:	Fort Lauderdale
Existing/New Project:	New Project
Project Mod/No Mod:	No mod
Project Length:	4 miles
Monument Range:	R-53-74
Potential Nearshore Berms:	No

Segment Design

Berm Width Extension:	25
Berm Height:	9 feet NGVD
Equilibrium Toe of Fill (With Advanced Nourishment):	500 feet
Foreshore Slope	1 V to 10 H
Nearshore Slope	1 V to 30 H
Initial Fill Volume (Including Advanced Nour.):	792,108 cubic yards
Renourishment Interval:	6 years
Renourishment Volume:	355,084 cubic yards

Environmental Impact

Hardground Impacted:	8.1 acres
New Beach Created:	12.1 acres

Benefits

Interest Rate:	7.625 %
Total Annual Benefits:	$ 2,055,200

Costs

Effective Date of Pricing:	5/16/95
Initial Fill and Advanced Nour.:	$11,886,600
Interest During Construction (IDC):	$228,700
Each Renourishment Cost:	$5,522,900
Renourishments During Proj. Life:	6
Average Annual Cost:	$1,683,400
B/C Ratio:	1.2
Net Annual Benefits:	$ 371,800
Recommended Federal Participation:	50 years

Cost Sharing

Federal:	55.90%
Non-Federal:	44.10%
Total Federal Cost:	$ 6,644,609
Total Non-Federal Cost:	$5,241,991

NED PROJECT SUMMARIES

Project:	Broward County, Florida Shore Protection Project
Segment:	J.U. Lloyd
Existing/New Project:	Existing
Project Mod/No Mod:	Project Mod
Project Length:	2.3 miles
Monument Range:	R-86-98
Potential Nearshore Berms:	Yes

Segment Design

Berm Width Extension:	0 feet
Berm Height:	
Equilibrium Toe of Fill (With Advanced Nourishment):	
Foreshore Slope	
Nearshore Slope	
Initial Fill Volume (Including Advanced Nour.):	
Renourishment Interval:	6 years
Renourishment Volume:	

Environmental Impact

Hardground Impacted:	0
New Beach Created:	0

Benefits

Interest Rate:	7.625 %
Total Annual Benefits:	

Costs

Effective Date of Pricing:	
Initial Fill and Advanced Nour.:	
Interest During Construction (IDC):	
Each Renourishment Cost:	
Renourishments During Proj. Life:	
Average Annual Cost:	
B/C Ratio:	
Net Annual Benefits:	
Recommended Federal Participation:	50 years

Cost Sharing

Federal:	
Non-Federal:	
Total Federal Cost:	
Total Non-Federal Cost:	

NED PROJECT SUMMARIES

Project:	Broward County, Florida Shore Protection Project
Segment:	Hollywood/Hallandale
Existing/New Project:	Existing
Project Mod/No Mod:	Project Mod
Project Length:	4 miles
Monument Range:	R-101-108
Potential Nearshore Berms:	Yes
Segment Design	
Berm Width Extension:	+50 feet
Berm Height:	7 feet NGVD
Equilibrium Toe of Fill (With Advanced Nourishment):	+230 feet
Foreshore Slope	1 V to 15 H
Nearshore Slope	1 V to 40 H
Initial Fill Volume (Including Advanced Nour.):	+720,000 cy
Renourishment Interval:	6 years
Renourishment Volume:	+720,000
Environmental Impact	
Hardground Impacted:	0 acres
New Beach Created:	31.8 acres
Benefits	
Interest Rate:	7.625 %
Total Annual Benefits:	$ 992,000
Costs	
Effective Date of Pricing:	5/16/95
Initial Fill and Advanced Nour.:	$3,567,400
Interest During Construction (IDC):	$68,700
Each Renourishment Cost:	$3,800,200
Renourishments During Proj. Life:	8
Average Annual Cost:	$805,300
B/C Ratio:	1.2
Net Annual Benefits:	$ 186,700
Recommended Federal Participation:	50 years
Cost Sharing	
Federal:	62.50%
Non-Federal:	37.50%
Total Federal Cost:	$ 2,229,625
Total Non-Federal Cost:	$1,337,775

NED PROJECT SUMMARIES

Project:	Dade County, Florida Shore Protection Project
Segment:	Golden Beach
Existing/New Project:	New Project
Project Mod/No Mod:	No mod
Project Length:	1.2 miles
Monument Range:	R-1-7
Potential Nearshore Berms:	Yes

Segment Design

Berm Width Extension:	100 feet
Berm Height:	8.2 feet NGVD
Equilibrium Toe of Fill (With Advanced Nourishment):	832 feet
Foreshore Slope	1 V to 10 H
Nearshore Slope	1 V to 30 H
Initial Fill Volume (Including Advanced Nour.):	534,600 cubic yards
Renourishment Interval:	6 years
Renourishment Volume:	223,560 cubic yards

Environmental Impact

Hardground Impacted:	5.25 acres
New Beach Created:	14.5 acres

Benefits

Interest Rate:	7.625 %
Total Annual Benefits:	$ 3,683,300

Costs

Effective Date of Pricing:	5/16/95
Initial Fill and Advanced Nour.:	$14,173,500
Interest During Construction (IDC):	$272,700
Each Renourishment Cost:	$5,521,100
Renourishments During Proj. Life:	8
Average Annual Cost:	$1,886,800

B/C Ratio:	2.0
Net Annual Benefits:	$ 1,796,500
Recommended Federal Participation:	50 years

Cost Sharing

Federal:	65.00%
Non-Federal:	35.00%
Total Federal Cost:	$ 9,212,775
Total Non-Federal Cost:	$4,960,725

NED PROJECT SUMMARIES

Project:	Dade County, Florida Shore Protection Project
Segment:	Sunny Isles
Existing/New Project:	Existing
Project Mod/No Mod:	Project Mod
Project Length:	2.65 miles
Monument Range:	R-7-20
Potential Nearshore Berms:	Yes

Segment Design

Berm Width Extension:	+20 feet
Berm Height:	8.2 feet NGVD
Equilibrium Toe of Fill (With Advanced Nourishment):	+200 feet
Foreshore Slope	1 V to 10 H
Nearshore Slope	1 V to 30 H
Initial Fill Volume (Including Advanced Nour.):	+146,700 cubic yards
Renourishment Interval:	10 years
Renourishment Volume:	+146,700 cubic yards

Environmental Impact

Hardground Impacted:	0 acres
New Beach Created:	6.4 acres

Benefits

Interest Rate:	7.625%
Total Annual Benefits:	$ 345,800

Costs

Effective Date of Pricing:	5/16/95
Initial Fill and Advanced Nour.:	$2,200,000
Interest During Construction (IDC):	$42,300
Each Renourishment Cost:	$2,200,000
Renourishments During Proj. Life:	5
Average Annual Cost:	$330,000
B/C Ratio:	1.05
Net Annual Benefits:	$ 15,800
Recommended Federal Participation:	50 years

Cost Sharing

Federal:	38.30%
Non-Federal:	68.70%
Total Federal Cost:	$ 842,600
Total Non-Federal Cost:	$1,357,400

NED PROJECT SUMMARIES

Project:	Dade County, Florida Shore Protection Project
Segment:	Bal Harbour/Surfside/Miami Beach
Existing/New Project:	Existing
Project Mod/No Mod:	No Mod
Project Length:	9.3 miles
Monument Range:	R-27-74
Potential Nearshore Berms:	Yes

Segment Design

Berm Width Extension:	0 feet
Berm Height:	
Equilibrium Toe of Fill (With Advanced Nourishment):	
Foreshore Slope	
Nearshore Slope	
Initial Fill Volume (Including Advanced Nour.):	
Renourishment Interval:	3 years
Renourishment Volume:	

Environmental Impact

Hardground Impacted:	0
New Beach Created:	0

Benefits

Interest Rate:	7.625 %
Total Annual Benefits:	

Costs

Effective Date of Pricing:	
Initial Fill and Advanced Nour.:	
Interest During Construction (IDC):	
Each Renourishment Cost:	
Renourishments During Proj. Life:	
Average Annual Cost:	

B/C Ratio:	
Net Annual Benefits:	
Recommended Federal Participation:	50 years

Cost Sharing

Federal:	
Non-Federal:	
Total Federal Cost:	
Total Non-Federal Cost:	

NED PROJECT SUMMARIES

Project:	Dade County, Florida Shore Protection Project
Segment:	Key Biscayne
Existing/New Project:	Existing
Project Mod/No Mod:	Project Mod
Project Length:	2.3 miles
Monument Range:	R-101-113
Potential Nearshore Berms:	No

Segment Design

Berm Width Extension:	+10 feet
Berm Height:	8.2 feet NGVD
Foreshore Slope	1 V to 10 H
Nearshore Slope	1 V to 30 H
Initial Fill Volume (Including Advanced Nour.):	+106,660 cubic yards
Renourishment Interval:	7 years
Renourishment Volume:	+106,660 cubic yards

Environmental Impact

Hardground Impacted:	0 acres
New Beach Created:	2.8 acres

Benefits

Interest Rate:	7.625%
Total Annual Benefits:	$ 65,700

Costs

Effective Date of Pricing:	5/16/95
Initial Fill and Advanced Nour.:	$330,000
Interest During Construction (IDC):	$6,350
Each Renourishment Cost:	$330,000
Renourishments During Proj. Life:	7
Total Project Cost:	$2,640,000
Average Annual Cost:	$63,700

B/C Ratio:	1.03
Net Annual Benefits:	$ 2,000
Recommended Federal Participation:	50 years

Cost Sharing

Federal:	48.9%
Non-Federal:	51.1%
Total Federal Cost:	$ 1,290,960
Total Non-Federal Cost:	$1,349,040

COAST OF FLORIDA EROSION AND STORM EFFECTS STUDY
REGION III - FEASIBILITY REPORT

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COAST OF FLORIDA EROSION AND STORM EFFECTS STUDY
REGION III - PALM BEACH, BROWARD AND DADE COUNTIES, FLORIDA
FEASIBILITY REPORT

INTRODUCTION

1. This report summarizes a cooperative cost shared feasibility study on the beach erosion and storm damage problems of the Atlantic Ocean shoreline of the lower southeast coast of Florida, including Palm Beach, Broward and Dade Counties. Included in this report are the results of planning, engineering, environmental, economic and real estate studies of the area and its shoreline erosion problems; and recommendations for modifications of the existing beach erosion control and shore protection projects.

Study Authority

2. This study is being conducted in response to Section 104, of Public Law (PL) 98-360, dated July 16, 1984, and a resolution dated August 8, 1984, by the Committee on Public Works and Transportation, of the U.S. House of Representatives which provide for the following:

3. Section 104, PL 98-360. "The Secretary of the Army, acting through the Chief of Engineers, is authorized to review, in cooperation with the State of Florida, its political subdivision, agencies and instrumentalities thereof, all previous published reports of the Chief of Engineers pertaining to shoreline erosion on the entire coast of Florida with a view to determining whether any modifications of the recommendations contained therein are advisable at this time, with particular reference to developing a comprehensive body of knowledge, information, and data on coastal area changes and processes."

4. House Resolution. "Resolved by the Committee on Public Works and Transportation of the House of Representatives, United States, that the Secretary of the Army, acting through the Chief of Engineers, in accordance with the provisions of Section 110 of the River and Harbor Act of 1962, is hereby authorized to study, in cooperation with the State of Florida, its political subdivision and agencies and instrumentalities thereof, the entire coast of Florida, including a determination of whether any modifications of the recommendations contained in previously published reports of the Chief of Engineers pertaining to shoreline erosion on the coast of Florida are advisable, and also including the development of a comprehensive body of knowledge, information, and data on coastal area changes and processes for such entire coast."

Purpose and Scope

5. The Federal interest is to reduce Federal expenditures by more efficiently managing the construction, operation and maintenance of Federal shore protection projects and new projects in Florida. The national interest in the study is founded in the existence of over 90 Federal navigation projects and 21 authorized Federal shore protection projects. The navigation projects include all major Florida ports, including 11 deepwater ports, 30 inlets and passes, and over 2,000 miles of navigation channels. Operation and maintenance of the navigation channels for these projects is in excess of $32 million annually. The 21 shore protection projects provide for restoration of 145 miles of shoreline. To date, 73 miles of these projects have been constructed at a cost exceeding $245 million. The Federal share of this cost exceeds $130 million.

6. The state of Florida's interests in the study stem from the state desire to eliminate or reduce the threat of erosion to both developed and undeveloped shorelines. The state program is based on a threefold approach. The first is to participate in the restoration of eroded beaches by funding up to 75 percent of the non-Federal costs for shore protection projects. The second is to regulate unwise development or encroachment of development along the shoreline seaward of the zone of impact from a 100-year storm event. The third is to purchase undeveloped coastal lands for preservation of the natural resources.

7. The coastal processes and natural resources along Florida's Gulf and Atlantic shoreline are being investigated on a regional basis, instead of a conventional project by project basis. It is expected that by developing/creating regional projects, considerable savings can be realized in the construction and maintenance of existing Federal projects, both for storm damage reduction and navigation. Considerable advances in computer technology within the last decade have resulted in the development of new coastal numerical modeling applications and geographic information systems (GIS). This new technology was utilized in this study. The comprehensive body of knowledge, information and data used has been collected and stored in the GIS database.

8. To effectively manage and support such a comprehensive and extensive study, Florida was divided into five coastal regions based on distinct differences between the areas, such as wave climate, coastal processes, and beach characteristics. The regions are as follows: Region I - panhandle; Region II - peninsular gulf coast to the northern extent of the Keys; Region III - southern east coast; Region IV - central east coast; and Region V - northern east coast

(Figure 1). Separate feasibility studies will be conducted, and reports prepared, for each region.

9. The first region studied and the focus of this Feasibility Report is Region III. This region includes Dade County from the southern end of Key Biscayne northward through Broward County up to and including Jupiter Inlet in northern Palm Beach County. This region was identified as the first region for study since it is the most densely populated coastal region in Florida.

10. Florida's 1990 population totaled 12,237,000 of which 5,668,000 or 44 percent live within 10 miles of the coast. Over 31 percent of Florida's population lives in these three counties. Eastern Florida has and will dominate population trends in the southern United States. Florida's population increased by 152 percent between 1960 and 1988. It's population is projected to increase by 226 percent by the year 2010. Dade, Broward, and Palm Beach counties are the three leading counties in the southeastern U.S. in population changes. It is expected that by the year 2010, Dade and Broward Counties will average 1,227 persons per square mile. Region III has the largest local, state and Federal investment in shore protection. Within the 87.9 miles of Region III shoreline (90.6 miles including inlet widths) there are 58 miles of initial beach restoration and 85 miles of periodic nourishment authorized as part of Federal shore protection projects. The Federal Government, in cooperation with the State of Florida and the project sponsors, has constructed approximately 33.4 miles of protective and recreational beach projects in Region III through September, 1993.

11. This document summarizes an assessment of erosion and storm effects on the shoreline of Region III. These studies and investigations have been undertaken as a cooperative effort between the U.S. Army Corps of Engineers (USACE) and the State of Florida Department of Environmental Protection (DEP), formerly the Florida Department of Natural Resources (DNR), the study sponsor.

The Report and Study Process

12. This report presents sufficient technical and economic analyses, environmental coordination and plan formulation to support the recommended project modifications located at the end of the main text. Included within this report are discussion of all existing Federal and non-Federal shore protection and navigation projects within Region III, plan formulation rationale and process, impact assessment of alternative plans, analyses of alternative plans, recommended project modification, implementation

COAST OF FLORIDA STUDY LOCATION MAP

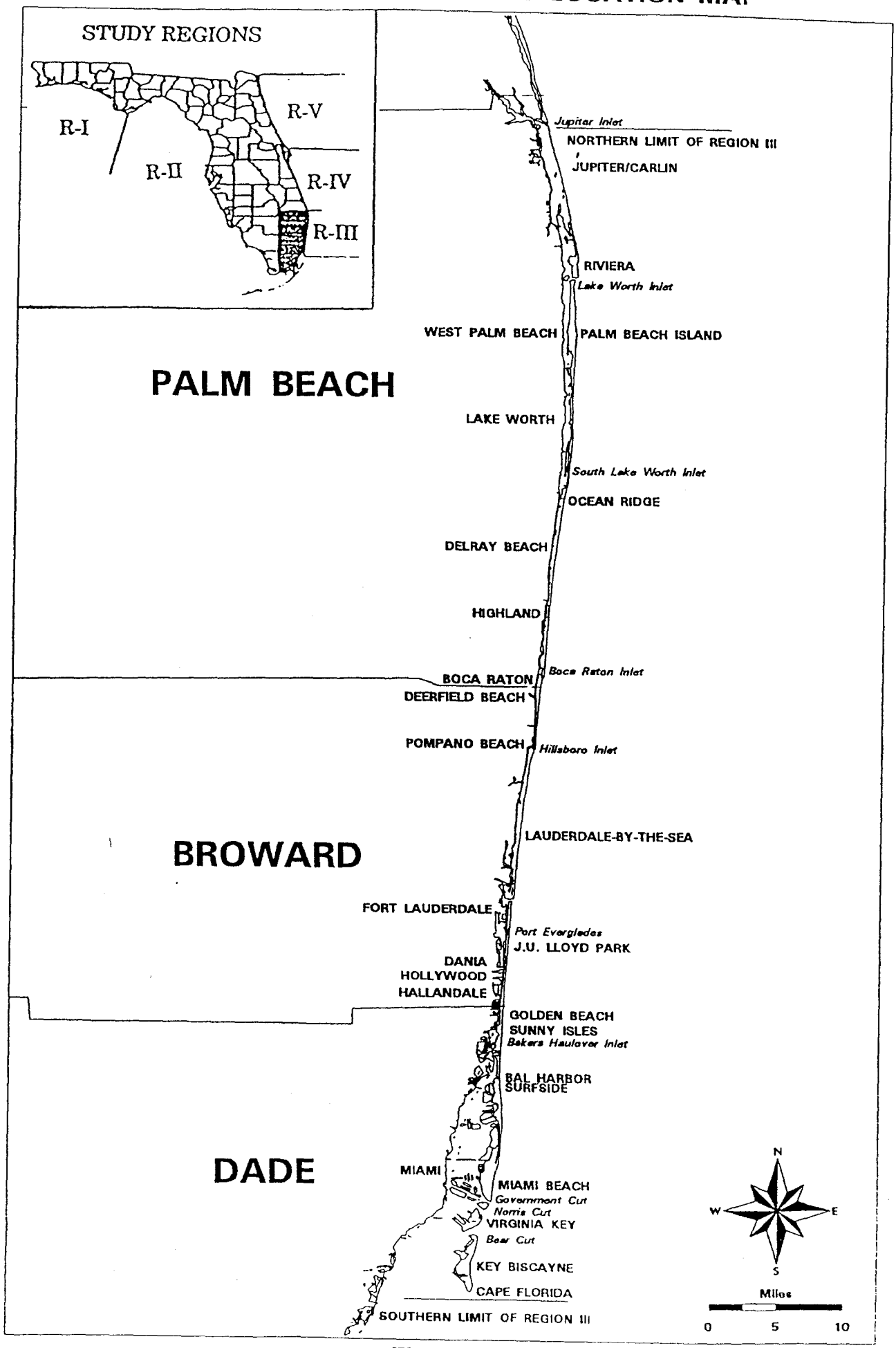

Figure 1

requirements (Federal and non-Federal), coastal engineering and geotechnical analyses.

13. The main report is a general presentation giving the results of the feasibility study for beach erosion and storm damage problems of the Atlantic ocean shoreline of the lower southeast coast of Florida, including Palm Beach, Broward and Dade Counties. It is the basic document presenting a broad view of the overall study and provides a generalized description and discussion of plan components and their functions and interaction. The main report will be submitted to Congress in compliance with the committee resolution authorizing the study.

14. The main text includes a draft Environmental Impact Statement (DEIS) which will be circulated under policies and procedures established for coordinating civil works activities pursuant to the requirements of the Office of Management and Budget's (OMB) Circular A-95 and the Fish and Wildlife Coordination Act. The DEIS is an interim document subject to revisions, and will become final when it is filed with the Environmental Protection Agency after review by the Office of the Chief of Engineers.

15. The eight appendices to the report present supporting data and details covering the features of the feasibility study for Region III as follows:

- Appendix A contains project maps for the existing Federal navigation and shore protection projects in Region III.

- Appendix B contains descriptions of prior reports and corrective actions.

- Appendix C contains pertinent correspondence relevant to this study.

- Appendix D contains engineering investigations, design and cost estimates.

- Appendix E contains geotechnical investigations.

- Appendix F contains the projects economic costs and benefits.

- Appendix G contains the real estate gross appraisal.

- Appendix H contains copies of the existing project cooperation agreements.

- Appendix I contains analysis of nearshore berms.

Study Background

16. The origins of the Coast of Florida Erosion and Storm Effects Study (commonly known as the Coast of Florida Study) can be traced to the University of Florida, Coastal and Oceanographic Engineering Department. In a letter to Jacksonville District dated October 24, 1983. The University transmitted a very general 7-page "Preliminary Program of Investigation, Coastal Sand Budget of Florida", and invited the U.S. Army Corps of Engineers to participate in a related meeting on November 10, 1983. Attendees at this meeting included representatives from the University of Florida, the Florida Department of Natural Resources (DNR), which was latter merged into the Florida Department of Environmental Protection (DEP), the Florida Shore and Beach Preservation Association (FSBPA), and the U.S. Army Corps of Engineers. Corps personnel from the Jacksonville District, the South Atlantic Division, the Coastal Engineering Research Center, and the Directorate of Research and Development in Washington attended.

17. The University of Florida's proposal discussed at the November 10, 1983 meeting comprised three elements: (1) data collection and organization, (2) assessment of data, and (3) application of results to shoreline problems. The document also stated that "the ultimate product [of the study] should enable communities and other agencies to plan and carry out erosion mitigation measures with greater economy and effectiveness than is now possible." Anticipated study roles by various organizations were also outlined. Federal authorization and funding was briefly mentioned by reference to the Coast of California Storm and Tidal Waves Study, a study authorized by the Flood Control Act of 1965. However, the ways and means of obtaining authority and funding for the Coast of Florida Study (COFS) were not clearly defined.

18. In response to considerable Congressional interest in the study, the Office of the Chief of Engineers met with various congressional interests and delegations to discuss possible authorization and funding scenarios. Senator Claude Pepper was instrumental in obtaining the study authorization, with support from the Governor and the DNR. The Director of Civil Works, in a letter dated May 4, 1984, to the Chairman of the House Committee on Public Works and Transportation, assured the committee that the study would be conducted in standard reconnaissance and feasibility phases to "assure greater local participation in planning and lead to an improved success rate, namely construction of projects." Through these efforts, the study authority was authorized on August 8, 1984.

19. The federally funded COFS reconnaissance report was completed in July 1986. The ASA(CW) approved the initiation of feasibility phase studies for the first region of (FCSA) study, Region III on August 14, 1987. The Feasibility Cost Sharing Agreement was signed by the Jacksonville District, U.S. Army Corps of Engineers and the DNR on June 29, 1988. The feasibility study was initiated in August 1988, following receipt of State funds. The cost of the feasibility study is cost shared on an equal 50-50 basis in accordance with Section 105 of the 1986 WRDA.

20. This report summarizes the review of all previously published reports of the Chief of Engineers pertaining to shoreline erosion within Region III as required by the study authority, and explores project modifications. The second purpose of the study was to develop a comprehensive body of knowledge, information, and data on coastal area changes and processes. Previously collected data as well as new specifically collected study data have been incorporated into the developed COFS GIS database. This information will be available to interested agencies or individuals through a central repository operated and maintained by the DEP. The repository is located at Florida State University (FSU). FSU is developing a prototype data retrieval link under contract to the DEP.

Study Area and Location

21. Region III consists of the Atlantic Ocean shoreline of Palm Beach, Broward and Dade Counties, located on Florida's lower southeast coast (Figure 1). Palm Beach County is the northernmost county in Region III, followed by Broward County and then Dade County at the southern end of the region. The northern limit of Region III is Jupiter Inlet and is about 80 miles north of Miami Beach. The northernmost 1.9 mile section of Palm Beach County north of Jupiter Inlet will be examined in detail as part of Region IV efforts, since this reach of beach falls within the St. Lucie to Jupiter Inlet littoral sediment transport zone. Within Region III, Palm Beach County has 42.8 miles of shoreline, Broward County has 23.4 miles and Dade County has 21.7 miles, for a total of about 87.9 miles of Atlantic Ocean shoreline in Region III. The southern limit of the Region III study area is the southern tip of Key Biscayne, the southernmost inhabited coastal barrier island in Dade County.

22. The study area fronts the Atlantic Ocean and is composed of a coastal barrier islands separated from the mainland by various lagoons and bays interconnected by a system of canals and navigation channels maintained as part of the Federal Intracoastal Waterway (ICWW) navigation